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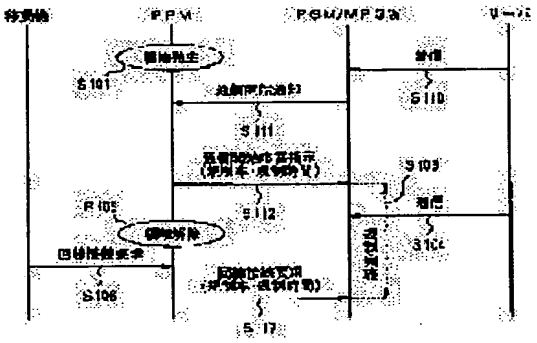
(54) MOBILE PACKET COMMUNICATION SYSTEM, AND COMMUNICATION REGULATION METHOD IN MOBILE PACKET COMMUNICATION NETWORK

(57)Abstract:
PROBLEM TO BE SOLVED: To realize quick recovery from a congestion state, by suppressing the quantity of transfer data from a peripheral connection device when a conges tion took place, and to suppress the congestion spread to a peripheral connection device.
SOLUTION: When a buffer congestion state has taken place in a packet subscriber processor (PPM), the processor transmits a regulation notification, together with an existing signal to a packet gate relay processor (PGW) and a packet gate relay processor for mobile message (M-PGW) to be connected. The existing signal to be transmitted together is, for example, a communication- start response instruction signal or a line connection request signal. The processors PGW and M-PGW regulate communication start notification to the processor PPM, according to the regulation rate and regulation time notified by a signal from the processor PPM. The regulation is released, when the processor receives a line connection request from the PPM or when a fixed time has elapsed.



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[Date of final disposal for application]

[Patent number]

[Date of registration]

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CLAIMS

[Claim(s)]
[Claim 1] Migration packet communication system characterized by including a notice means of regulation to transmit the notice of regulation for regulating a communication link, to the gateway unit which answers that congestion occurred in the migration packet communication network, and connects this migration packet communication network to other networks.
[Claim 2] Said notice means of regulation is migration packet communication system according to claim 1 characterized by transmitting said notice of regulation immediately after detecting generating of said congestion.
[Claim 3] Said notice means of regulation is migration packet communication system according to claim 1 characterized by including said notice of regulation in the existing signal, and transmitting.
[Claim 4] Said notice of regulation is migration packet communication system given in any 1 term of claims 1-3 characterized by including the information which shows the rate of regulation which is a rate which discards the data which should communicate essentially.
[Claim 5] Said notice of regulation is migration packet communication system given in any 1 term of claims 1-4 characterized by including the information which shows the regulation time amount which is the time amount which regulates a communication link.
[Claim 6] The communication link regulation approach of carrying out containing the notice step of regulation which transmits the notice of regulation for regulating a communication link to the gateway unit which answers the detection step which is the communication link regulation approach in a migration packet communication network, and detects generating of the congestion in said migration packet communication network, and detection of this congestion, and connects this migration packet communication network to other networks as the description.
[Claim 7] The communication link regulation approach according to claim 6 characterized by transmitting said notice of regulation immediately after detecting generating of congestion in said detection step in said notice step of regulation.
[Claim 8] The communication link regulation approach according to claim 6 characterized by including said notice of regulation in the existing signal, and transmitting in said notice step of regulation.
[Claim 9] Said notice of regulation is the communication link regulation approach given in any 1 term of claims 6-8 characterized by including the information which shows the rate of regulation which is a rate which discards the data which should communicate essentially.
[Claim 10] Said notice of regulation is the communication link regulation approach given in any 1 term of claims 6-9 characterized by including the information which shows the regulation time amount which is the time amount which regulates a communication link.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the data transfer regulation between the data processors (exchange) especially in migration packet communication system about migration packet communication system and the communication link regulation approach in a migration packet communication network.
[0002]
[Description of the Prior Art] Along with the spread of mobile computing, subscription to an electronic mail or the IP connection service by the portable telephone with easy Web access is increasing. Furthermore, it is expected from now on by offer of the arrival-of-the-mail mold (Push mold) services including the information distribution from a content provider, and mass-data-ization of contents that traffic increases. For this reason, it is important to suppress the node down by generating of momentary arrival-of-the-mail system traffic and a mass data and influencing of congestion.
[0003] Here, drawing 7 is the block diagram showing notionally an example of PDC (Personal Digital Cellular) migration packet communication system. PDC migration packet communication system is ****(ed) at least including the migration machine (MS:Mobile Station) 11, the base station (BS:BaseStation) 12, the packet subscriber system processor 13, the packet gateway junction processor 14 for migration messages, and the packet gateway junction processor 15 as shown in this drawing.
[0004] Through gateway server equipment 21, IP (Information Provider) server equipment 22 and the Internet 200 were accessed, and the packet gateway junction processor 14 for migration messages has connected these and the migration packet communication network 100. Moreover, it connected with a network service provider (NSP) / intranet 300, and the packet gateway junction processor 15 has connected these and the migration packet communication network 100.
[0005] In such a configuration, when the buffer of the packet subscriber system processor 13 etc. changes into a congestion condition, the notice of regulation is performed to the migration machine 11 through a base station 12, and congestion recovery of the packet subscriber system processor 13 is aimed at by regulating the dispatch from the migration machine 11. Generally, in a packet subscriber system processor, probability regulation, user packet regulation, total volume control, etc. perform a congestion control.
[0006] In probability regulation, when it went up, or it gets down and the buffer congestion corresponding to a packet occurs, a packet subscriber system processor (PPM:Packet Processing Module) transmits regulation information to subordinate area to the migration machine which carries out a ** area via a base station controller (BCE:Base station Controller Equipment), and a migration machine controls dispatch according to the set-up rate of regulation.
[0007] In user packet regulation, in order to prevent the buffer congestion by mass-data reception of a specific subscriber, the queue length per subscriber is managed and a new queue is canceled with relation with a buffer activity ratio. In total volume control, about the call connection signal of the new connection from a migration machine, when the maximum processing number of calls in the fixed period set up beforehand is exceeded, regulation is exercised, and generating of an invalid call is inhibited.
[0008]
[Problem(s) to be Solved by the Invention] When a packet subscriber system processor changes into a congestion condition, it cannot be said that it is enough as a congestion control only by regulating the dispatch from a migration machine. That is, since the packet gateway junction processor and the packet gateway junction processor for migration MESSE 1 JI are also connected to the packet subscriber system processor, when

congestion occurs in a packet subscriber system processor, a lot of [momentary and] arrival-of-the-mail demand is anxious about congestion influencing in protraction of a congestion condition, a packet gateway junction processor, and the packet gateway junction processor for migration messages.
[0009] Then, it is expectable to prevent long-duration-izing of a congestion condition and influencing to other equipments by regulating also about the signal from the packet gateway junction processing control device (PGW:Packet GateWay) which a packet subscriber system processor connects, and the packet gateway junction processor for migration messages (M-PGW:Mobile Message Packet GateWay) in addition to the congestion control explained above.
[0010] The purpose of this invention is offering the migration packet communication system which can notify a regulation condition from a packet subscriber system processor to a packet gateway junction processor and the packet gateway junction processor for migration messages, and can regulate the incoming call to an applicable packet subscriber system processor with a packet gateway junction processor and the packet gateway junction processor for migration messages, and the communication link regulation approach in a migration packet communication network.
[0011]
[Means for Solving the Problem] Migration packet communication system by claim 1 of this invention is characterized by including a notice means of regulation to transmit the notice of regulation for regulating a communication link, to the gateway unit which answers that congestion occurred in the migration packet communication network, and connects this migration packet communication network to other networks. Thereby, it can prevent congestion affecting gateway units, such as a packet gateway junction processor for migration messages, and a packet gateway junction processor.
[0012] Migration packet communication system by claim 2 of this invention is characterized by said notice means of regulation transmitting said notice of regulation immediately after detecting generating of said congestion in claim 1. Thereby, influencing of congestion can be prevented immediately. Migration packet communication system by claim 3 of this invention is characterized by for said notice means of regulation including said notice of regulation in the existing signal, and transmitting it in claim 1. Since it is not necessary to define a new signal by carrying out like this, effect of the load on the packet subscriber system processor in a migration packet communication network can be lessened.
[0013] It is characterized by the migration packet communication system by claim 4 of this invention including the information which shows the rate of regulation which is a rate which discards the data with which said notice of regulation should communicate essentially in any 1 term of claims 1-3. By carrying out like this, communication link regulation can be performed according to the notified rate of regulation. It is characterized by the migration packet communication system by claim 5 of this invention including the information which shows the regulation time amount which is the time amount to which said notice of regulation regulates a communication link in any 1 term of claims 1-4. By carrying out like this, when the notified regulation time amount is completed, regulation can be canceled autonomously.
[0014] The communication link regulation approach by claim 6 of this invention is the communication link regulation approach in a migration packet communication network, and it carries out containing the notice step of regulation which transmits the notice of regulation for regulating a communication link to the gateway unit which answers the detection step which detects generating of the congestion in said migration packet communication network, and detection of this congestion, and connects this migration packet communication network to other networks as the description. Thereby, it can prevent congestion affecting gateway units, such as a packet gateway junction processor for migration messages, and a packet gateway junction processor.
[0015] The communication link regulation approach by claim 7 of this invention is characterized by transmitting said notice of regulation immediately after detecting generating of congestion in said detection step in said notice step of regulation in claim 6. Thereby, influencing of congestion can be prevented immediately. The communication link regulation approach by claim 8 of this invention is characterized by including said notice of regulation in the existing signal, and transmitting in said notice step of regulation in claim 6. Since it is not necessary to define a new signal by carrying out like this, effect of the load on the packet subscriber system processor in a migration packet communication network can be lessened.
[0016] It is characterized by the communication link regulation approach by claim 9 of this invention including the information which shows the rate of regulation which is a rate which discards the data with which said notice of regulation should communicate essentially in any 1 term of claims 6-8. By carrying out like this, communication link regulation can be performed according to the notified rate of regulation. It is characterized

by the communication link regulation approach by claim 10 of this invention including the information which shows the regulation time amount which is the time amount to which said notice of regulation regulates a communication link in any 1 term of claims 6-9. By carrying out like this, when the notified regulation time amount is completed, regulation can be canceled autonomously.
[0017] In short, when congestion occurred with a packet subscriber system processor, the originating call control from a migration machine was carried out conventionally. In this system, it regulates also about the data transfer from the connected gateway unit, i.e., a packet gateway junction processor, and the packet gateway junction processor for migration messages. Thereby, a packet subscriber system processor can regulate the data transfer from a packet gateway junction processor and the packet gateway junction processor for migration messages at the time of congestion, and the early convalescence of a congestion condition becomes possible. Moreover, effect of the load on a packet subscriber system processor can be lessened by notifying regulation using the existing signal.
[0018]
[Embodiment of the Invention] Next, the gestalt of operation of this invention is explained with reference to a drawing. In addition, in each drawing referred to in the following explanation, the same sign is given to other drawings and equivalent parts. Drawing 1 is the block diagram showing the configuration of the migration packet communication system by this invention. In the packet subscriber system processor 13, the congestion detection section 131 which detects a congestion condition, and the notice section 132 of regulation which answers that this congestion detection section 131 detected congestion, and performs the notice of regulation are formed as shown in this drawing.
[0019] In this configuration, when the packet subscriber system processor 13 changes into a congestion condition, the congestion detection section 131 detects it and the notice section 132 of regulation performs the notice of regulation to a packet gateway junction processor and the packet gateway junction processor for migration messages. This notice of regulation defines a new signal as mentioning later, or is performed using the existing signal.
[0020] When using the existing signal, the communication link initiation response indication signal which the information which shows the information and regulation time amount which show the rate of regulation was made to share is transmitted to the notice signal of communication link initiation received at the time of the arrival from a packet gateway junction processor or the packet gateway junction processor for migration messages. Moreover, the rate of regulation and regulation time amount are made to share the line connection demand signal transmitted to a packet gateway junction processor and the packet gateway junction processor for migration messages from a packet subscriber system processor at the time of the dispatch from a migration machine at the time of congestion generating. The rate of regulation is a rate which discards the data which should communicate essentially. Moreover, regulation time amount is time amount which regulates a communication link.

[0021] The packet gateway junction processor and the packet gateway junction processor for migration messages which received these communication link initiation response indication signal or the line connection demand signal perform, the processing, i.e., the regulation, which deletes the data to subsequent notifying agency packet subscriber system processors according to the information on the rate of regulation, and regulation time amount. Then, when the congestion of a packet subscriber system processor is recovered, information without rate of regulation nothing and regulation time amount is made to share the line connection demand signal transmitted to a packet gateway junction processor and the packet gateway junction processor for migration messages from a packet subscriber system processor at the time of the dispatch from a migration machine. The packet gateway junction processor and the packet gateway junction processor for migration messages which received this line connection demand signal cancel data deletion processing to a notifying agency packet subscriber system processor (deregulation), and permit connection.
[0022] In addition, a packet gateway junction processor and the packet gateway junction processor for migration messages cancel autonomously the data deletion processing to a notifying agency packet subscriber system processor after the notified regulation time amount progress, and you may make it permit connection.
Furthermore, actuation of this system is explained with reference to a sequence diagram. In PDC migration packet communication system, drawing 2 - drawing 6 are the sequence diagrams showing the signal transmission and reception between the migration machine at the time of recovering a congestion condition, a packet subscriber system processor, a packet gateway junction processor and the packet gateway junction processor for migration messages, server equipment, and each equipment, when a packet subscriber system processor

changes into a congestion condition.
[0023] In drawing 2 , if it detects that the congestion condition occurred (S101), a packet subscriber system processor (PPM) will transmit the notice of regulation (S102) which is a new signal to a packet gateway junction processor (PGW) and the packet gateway junction processor (M-PGW) for migration messages. The rate of regulation and regulation time amount shall be included in this notice of regulation.
[0024] From a packet subscriber system processor (PPM), the packet gateway junction processor (PGW) and the packet gateway junction processor (M-PGW) for migration messages which received the notice of regulation (S102) regulate (S103), and cancel a packet according to the notified rate of regulation. For this reason, it may be canceled even when there is arrival (S104) from a server.
[0025] A packet subscriber system processor (PPM) cancels regulation, when having recovered the congestion condition (congestion discharge) is detected (S105). There are the following three methods in this deregulation. After recovering a congestion condition as the 1st discharge method is shown in this drawing, it answers that there was a line connection demand (S106) from a migration machine, and a packet subscriber system processor (PPM) transmits a line connection demand (S107) to a packet gateway junction processor (PGW) and the packet gateway junction processor (M-PGW) for migration messages first. By receiving this line connection demand (S107), a packet gateway junction processor (PGW) and the packet gateway junction processor (M-PGW) for migration messages cancel regulation.
[0026] The 2nd discharge method transmits the notice of deregulation (S108) whose packet subscriber system processor (PPM) is a new signal to a packet gateway junction processor (PGW) and the packet gateway junction processor (M-PGW) for migration messages, after recovering a congestion condition as shown in drawing 3 . By receiving this notice of deregulation (S108), a packet gateway junction processor (PGW) and the packet gateway junction processor (M-PGW) for migration messages cancel regulation. When the rate of regulation is not 100% (all regulations), a packet gateway junction processor (PGW) or the packet gateway junction processor (M-PGW) for migration messages may receive the above-mentioned line connection demand during regulation. For this reason, the above-mentioned line connection demand may not be appropriate as a deregulation opportunity. So, when the rate of regulation is not 100% (all regulations), it is desirable to adopt this 2nd method. In addition, the deregulation by the 1st method mentioned above, i.e., a line connection demand, can change with the effective means as a discharge opportunity at the time of 100% regulation.
[0027] When the regulation time amount notified by the notice of regulation passes as the 3rd discharge method is shown in drawing 4 , a packet gateway junction processor (PGW) and the packet gateway junction processor (M-PGW) for migration messages cancel regulation autonomously. That is, when the time check was started from regulation start time, it regulates until regulation time amount passed, and regulation time amount passes, a packet gateway junction processor (PGW) and the packet gateway junction processor (M-PGW) for migration messages cancel regulation autonomously, even if a demand etc. is not transmitted from a packet subscriber system processor (PPM).
[0028] As mentioned above, in the system explained with reference to drawing 2 - drawing 4 , the notice of regulation (S102) which is a new signal was defined, and the congestion control is realized using this. For this reason, the notice of regulation can be transmitted immediately after congestion generating, and congestion can be immediately detected with a packet gateway junction processor and the packet gateway junction processor for migration messages. However, if the notice of regulation is performed to two or more contacts, we will be anxious about the load to the packet subscriber system processor (PPM) currently congestion generated. For this reason, it is desirable to adopt the system of the following which used the existing signal.
[0029] Namely, when it is detected that the congestion condition occurred as shown in drawing 5 (S101), a packet subscriber system processor (PPM) does not notify regulation immediately. When arrival of the mail (S110) is answered from server equipment and the notice of communication link initiation (S111) is received from a packet gateway junction processor (PGW) and the packet gateway junction processor (M-PGW) for migration messages The communication link initiation response directions (S112) to it notify regulation. In this case, the parameter which shows the rate of regulation and regulation time amount is added to communication link initiation response directions (S112).
[0030] The packet gateway junction processor (PGW) and the packet gateway junction processor (M-PGW) for migration messages which received the communication link initiation response directions (S112) from a packet subscriber system processor (PPM) regulate (S103), and cancel a packet according to the notified rate of regulation. For this reason, it may be canceled even when there is arrival (S104) from a server.
[0031] A packet subscriber system processor (PPM) cancels regulation, when having recovered the congestion

condition (congestion discharge) is detected (S105). There are the following two methods in this deregulation. After recovering a congestion condition as the 1st discharge method is shown in this drawing, it answers that there was a line connection demand (S106) from a migration machine, and a packet subscriber system processor (PPM) transmits a line connection demand (S117) to a packet gateway junction processor (PGW) and the packet gateway junction processor (M-PGW) for migration messages first. This line connection demand (S117) is also the existing signal. However, the parameter which shows the rate of regulation and regulation time amount is added to this line connection demand (S117). In order to cancel regulation, the rate of regulation is made into zero, and a line connection demand (S117) is transmitted by making regulation time amount into zero. By receiving this line connection demand (S117), a packet gateway junction processor (PGW) and the packet gateway junction processor (M-PGW) for migration messages cancel regulation.

[0032] When the regulation time amount notified by communication link initiation response directions (S112) passes as the 2nd discharge method is shown in drawing 6 , a packet gateway junction processor (PGW) and the packet gateway junction processor (M-PGW) for migration messages cancel regulation autonomously. That is, when the time check was started from regulation start time, it regulates until regulation time amount passed, and regulation time amount passes, a packet gateway junction processor (PGW) and the packet gateway junction processor (M-PGW) for migration messages cancel regulation autonomously, even if a demand etc. is not transmitted from a packet subscriber system processor (PPM).

[0033] As explained with reference to drawing 5 and drawing 6 , a packet gateway junction processor (PGW) and the packet gateway junction processor (M-PGW) for migration messages will detect congestion with the communication link initiation response directions after congestion generating. however, the communication link initiation response directions used in this case — the time of a communication link — a packet subscriber system processor - packet gateway — from it being the signal surely generated between a junction processor / packet gateway junction processor for migration MESSE 1 JI, if traffic is usually taken into consideration, it is detectable immediately after congestion generating. Moreover, since these communication link initiation response directions are the existing signals, they have the merit that there is little effect of the load on a packet subscriber system processor (PPM), compared with the case of drawing 2 and drawing 4 .

[0034] As explained above, when congestion occurred in a packet subscriber system processor, the data transmission from a packet gateway junction processor and the packet gateway junction processor for migration messages was not regulated conventionally. On the other hand, in this system, it becomes controllable [the data transfer from a packet gateway junction processor and the packet gateway junction processor for migration messages] at the time of the congestion of a packet subscriber system processor, and the early convalescence of a congestion condition becomes possible at it.

[0035] By the way, the following communication link regulation approaches are realized in the migration packet communication system explained above. That is, it is the communication link regulation approach in a migration packet communication network, and the communication link regulation approach of containing the notice step of regulation which transmits the notice of regulation for regulating a communication link is realized to the gateway unit which answers the detection step which detects generating of the congestion in the above-mentioned migration packet communication network, and detection of this congestion, and connects this migration packet communication network to other networks. Thereby, it can prevent congestion affecting gateway units, such as a packet gateway junction processor for migration messages, and a packet gateway junction processor.

[0036] Moreover, in the above-mentioned notice step of regulation, the above-mentioned notice of regulation is transmitted immediately after detecting generating of congestion in said detection step. Thereby, influencing of congestion can be prevented immediately. In addition, in the above-mentioned notice step of regulation, the above-mentioned notice of regulation may be included in the existing signal, and you may transmit. Since it is not necessary to define a new signal by carrying out like this, effect of the load on the packet subscriber system processor in a migration packet communication network can be lessened.

[0037] Furthermore, the above-mentioned notice of regulation shall include the information which shows the rate of regulation which is a rate which discards the data which should communicate essentially. By carrying out like this, communication link regulation can be performed according to the notified rate of regulation. And the above-mentioned notice of regulation shall include the information which shows the regulation time amount which is the time amount which regulates a communication link. By carrying out like this, when the notified regulation time amount is completed, regulation can be canceled autonomously.

[0038]

[Effect of the Invention] As explained above, when a packet subscriber system processor is congestion by

regulating about the data transfer from the connected gateway unit, this invention can regulate the data transfer from a gateway unit, and is effective in the ability to plan early convalescence of a congestion condition. Moreover, it is effective in the ability to lessen the load of a packet subscriber system processor by notifying regulation using the existing signal.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the block diagram showing one gestalt of operation of the migration packet communication system by this invention.
[Drawing 2] It is the sequence diagram showing the example of the migration packet communication system by this invention of operation.
[Drawing 3] It is the sequence diagram showing the example of the migration packet communication system by this invention of operation.
[Drawing 4] It is the sequence diagram showing the example of the migration packet communication system by this invention of operation.
[Drawing 5] It is the sequence diagram showing the example of the migration packet communication system by this invention of operation.
[Drawing 6] It is the sequence diagram showing the example of the migration packet communication system by this invention of operation.
[Drawing 7] It is the block diagram showing the configuration of the conventional migration packet communication system.
[Description of Notations]
11 Migration Machine
12 Base Station
13 Packet Subscriber System Processor
14 Packet Gateway Junction Processor for Migration Messages
15 Packet Gateway Junction Processor
21 Gateway Server Equipment
22 IP Server Equipment
100 Migration Packet Communication Network
131 Congestion Detection Section
132 Notice Section of Regulation
200 Internet
300 NSP/Intranet

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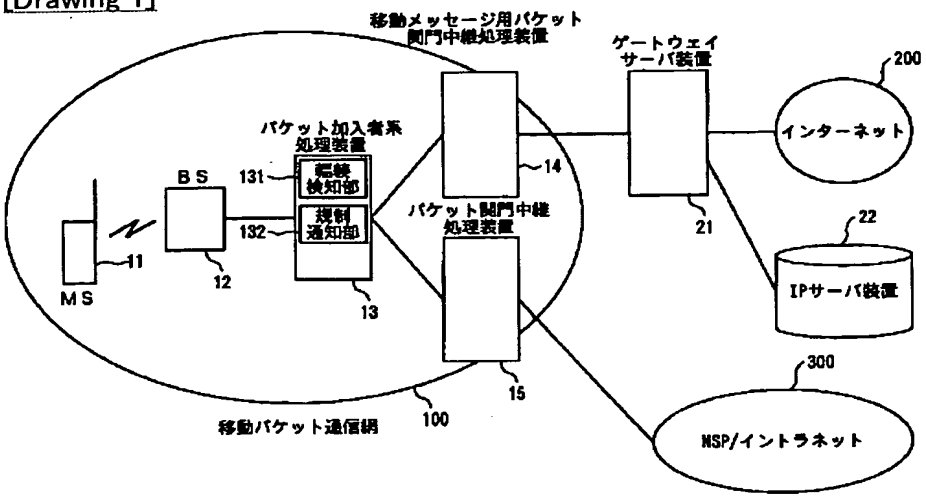
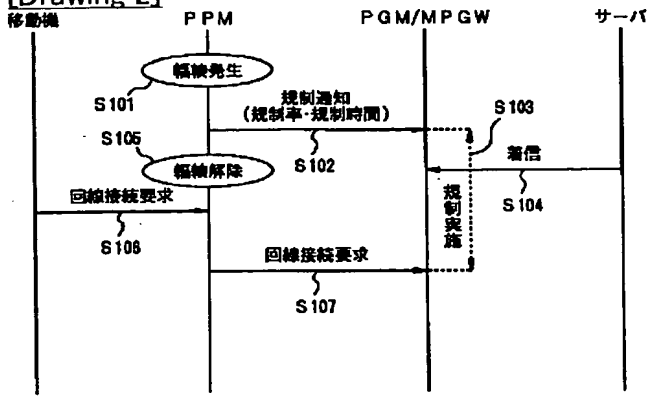
DRAWINGS

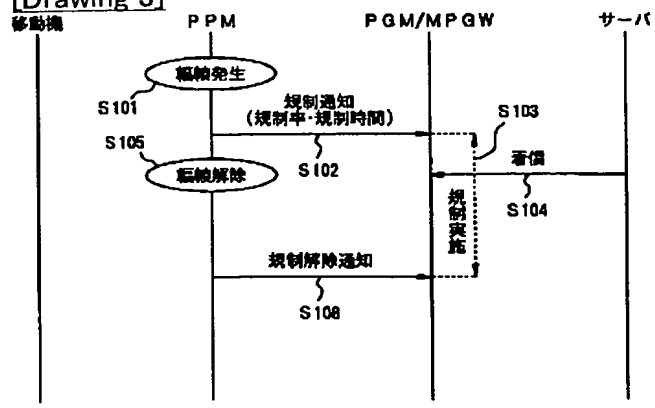
[Drawing 1]



[Drawing 2]



[Drawing 3]



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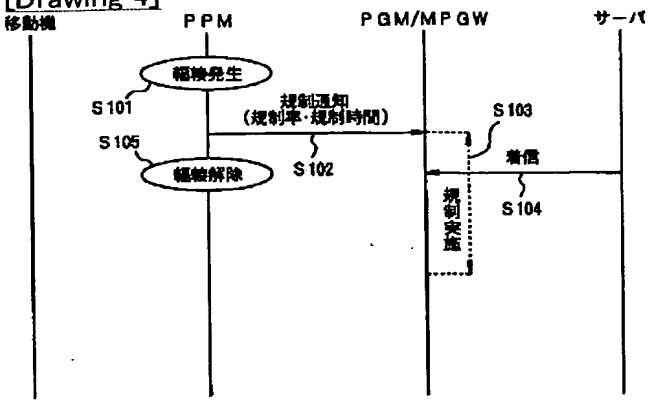

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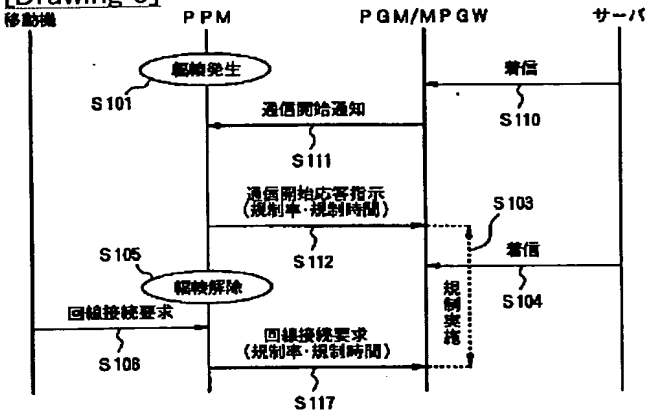
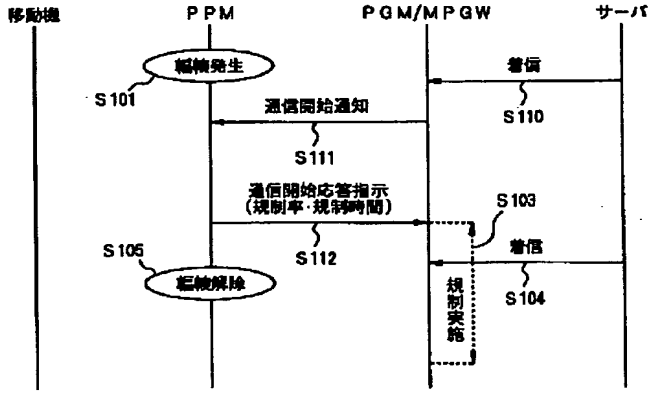
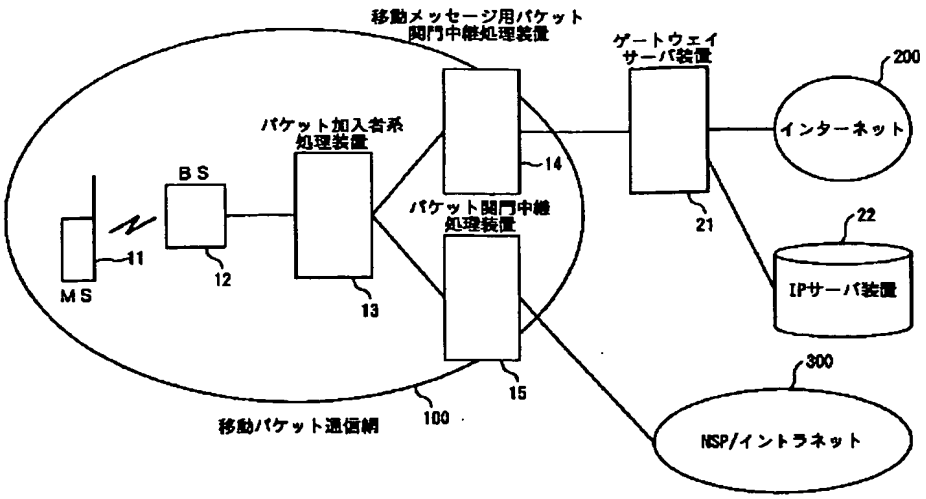


[Drawing 6]



[Drawing 7]



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